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Technical Article

# Choosing the Correct Roller Housed Unit – Step by Step

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# Choosing the Correct Roller Housed Unit – Step by Step

You need a roller bearing housed unit. How hard can it be to find the right one? Not hard at all – if you know what to look for.


## Abstract

When it comes to housed units, industrial equipment needs vary. From applications requiring high precision to those with brute-force demands in highly contaminated environments, housed units need to offer the appropriate bearing protection for supporting shafts, gears and other rotating and oscillating components. Choose the right one, and get the performance needed for the job. Choose the wrong one, and suffer from less-than-stellar performance, downtime and possibly a higher total cost of ownership than planned.

One of the great advantages of housed units is their broad standardization of mounting configurations and dimensions, offering a wide variety of options and solutions for both new and replacement applications. With so many options – split block and solid block, cast steel and cast iron, not to mention multiple seal types and locking mechanism options – it can be confusing and difficult to choose the right unit for your applications. What factors should you consider when choosing one that can deliver performance and reliability? We'll take it step by step.

## Start With The Basics

A housed unit, often referred to as a pillow block, is a self-contained bearing system. Housed units include the bearing, housing, seals, lubrication and shaft-locking mechanism. With their layers of protection, housed units are most often used in high-contamination environments to maintain the bearing's performance.

Our discussion focuses on roller bearing housed units because these are widely used in demanding applications where the choice of housed unit is especially critical. Roller housed units operate well in conveyor systems, material handling equipment, fans, blowers and other equipment designed to manage high loads and low speeds while operating in contaminant-filled environments. If you work in cement, aggregate, power generation, mining, pulp and paper, lumber or steel production, you have equipment with roller housed units, and you are probably concerned about the reliability and performance of those units.

In demanding applications that use roller bearing housed units, the most frequently used bearing types are spherical roller bearings and tapered roller bearings.

Spherical roller bearings are most common in general industrial applications, as they provide good performance and capacity in supporting radial loads with limited axial loading. They also manage normal levels of dynamic misalignment of the shaft (+/- 1.5 degrees), often making them the preferred choice for roller housed units.

Tapered roller bearings support radial and axial loads – such as those found in large fans, screw conveyors and augers. Applications with vertical shaft mounts (which often lead to high axial loads) or those requiring high levels of rigidity and limited play make tapered roller bearings a good choice.

Compared to ball bearing housed units, roller bearing housed units are the workhorses of the housed unit world. And selection matters. The right unit brings benefits to performance, uptime, maintenance needs and total cost of ownership.

What do you need to choose a roller housed unit? Let's start with housing style, and then look at options for housing material, seals and locking mechanisms.

## Housing Type and Material

The place to begin selecting the best roller unit option for your application is with housing type, which can impact total cost of ownership and ease of installation.

Roller bearing housings come in two varieties. The first, known as a split block, can be taken apart and contains components that can be replaced and repaired. The second, known as a solid block, is supplied as a completely assembled, one-piece unit.

Split and solid blocks both offer advantages, though different. Split-block units have a modular design, allowing inventory costs to be lower. One housing size can be used for different shaft diameters or bearings. Split-blocks use centered, identical width locating rings to fix the bearing. Split-block housings typically have dimples in the cast surface, allowing easy location to drill and tap holes for lubricating and monitoring systems or additional fastening bolts. Seal types can easily be changed (two-lip seals, V-ring seals, labyrinth seals, taconite seals), depending on the operating conditions.

For shafts greater than 125 mm (5 in.), split-block units are generally preferred. Given their large size, it is often easier to manage these larger units in pieces due to the overall weight of the unit. The split housing design allows you to take them apart and install them in sections. Then, later, if the unit requires maintenance, bearings and seals can be changed out without having to replace the entire heavy unit or remount the base.

For shafts less than 125 mm (5 in.), solid-block units make the most sense because unit size and weight are less of an issue with installation. Factory assembled, pre-greased and sealed, these units go directly from shelf to shaft, and they can be secured and aligned within 15 minutes.

Split block units typically take about 80-90 minutes to install and require skilled maintenance personnel to ensure proper assembly and alignment. Installers use feeler gauges to set the correct internal bearing clearance to ensure a proper fit on the shaft. Installers must also apply the right amount of torque when tightening housing cap bolts to avoid damaging the cap. In addition, they need to pack the unit with grease prior to mounting (see pages 4 and 5 for more on lubrication).

*Figure 1:*
*This group of housed units includes split blocks (two center units) and solid blocks (outer units).*

Solid-block and split-block housed units are typically configured with the popular pillow block style. Solid-block units also are offered with a variety of housing styles, such as square and round flanges, take-up blocks and piloted flanges.

The most common housing material is cast iron. However, some applications with very high impact loads or non-horizontal mounting (vertical or upside-down) require higher strength housings. In these applications, roller bearing seats in standard cast-iron units can experience plastic deformation or "pounding out." Vertical or upside-down mounting may reduce typical capacity ratings for cast-iron housings.

Ductile cast iron offers additional strength and protection from high shock loading. Cast steel offers still more strength and can be mounted in any configuration without a reduction in capacity ratings.

## Lubrication and Seals

*Figure 2:*
*A spherical roller bearing solid-block housed unit installed on a conveyor at a coal mine.*

When roller housed units don't reach their maximum life expectancy, it is often the result of improper lubrication practices or ingress of contamination. A strong and effective seal is critical for keeping interior contact surfaces debris-free and properly lubricated, which in turn preserves bearing life and improves uptime.

Options abound when choosing seal type, including contact designs, which offer a lip that has physical contact with the shaft; and non-contact designs, which seal without any physical contact.

Popular seal styles are described below.

- Double lip – One of the more common contact-seal types with good wear resistance at low speeds
- Triple lip – Contact-seal that offers superior protection at low to moderate speeds
- LOR – Non-contact design preferred for high speeds and/or low-torque environments
- V-ring – Two-piece contact design for high-speed applications or where shaft roughness leads to premature wear
- Labyrinth – Non-contact, grooved design preferred for high-temperature, high-speed environments
- Taconite – Named after an iron ore dust that's difficult to seal against; contact design preferred for high-contamination areas

*Figure 3:*
*Housed units are often used in demanding applications – such as the conveyor system of a coal mine – to improve bearing performance.*

The choice of seal material also affects seal life, so be sure to consider the condition of your application environment when making a decision. Nitrile rubber is the most common seal material and is effective for most contact-lip seals used in industrial applications. Viton® and Teflon® offer the capability to withstand higher temperatures and speeds, respectively.

For added protection, there are secondary seals, covers and end caps that can be added to solid-block housed units. If the application involves excessive water, dust and/or slurries or if the bearing unit requires clean lube inside, consider a solid-block unit with covers.

Split blocks use seals that ride on the machined shaft. Solid-block units are designed such that the seal contacts the ground inner ring of the bearing, providing a very effective sealing interface. Also, because the seal contacts the inner ring of the bearing, the potential for shaft damage due to seal wear is virtually eliminated.

Relubrication of housed units often is required to ensure proper bearing performance. Frequency and quantity of lubrication depend on operating conditions. Demanding applications, such as those operating in environments with high levels of debris or in washdown conditions, often require more frequent lubrication. Correct lubrication practices and an effective seal help keep debris and water out and grease in, which will reduce maintenance intervals and lower costs.

There is a wide range of greases available for roller bearing housed units, including those capable of protecting bearings in high-temperature environments and others with anti-wear or water-resistant additives. You should always follow original equipment manufacturers' recommendations regarding grease selection, purging and replenishing.

## Locking Mechanisms

The right shaft-locking mechanism can simplify and speed up housed unit installation and maintenance, as well as help ensure trouble-free operation. With split-block units, the usual choice is a tapered shaft-lock mechanism that provides flexibility in the axial positioning of the bearing on the shaft and secure locking on the shaft. With solid-block units, however, there are many more options, depending on priorities, shaft design and mounting considerations.

The following table describes popular options for locking mechanisms and the applications in which they are typically used.

| Locking Mechanism | Priority | Typical Application |
|---|---|---|
| **Tapered lock** | • For shafts supporting other equipment in addition to the housed unit | • Line shafts for material handling equipment and conveyor belt positions in bulk material handling |
| **Eccentric lock** | • Speed and ease of installation | • Reversing applications, such as V-rolls in metal roll transfer lines; press rolls, in-feed and out-feed rolls |
| **V-lock** | • Ease of installation without the use of feeler gauges | • Steel mills, sawmills and other forest products industries, aggregate and cement, mining, power generation, pulp and paper |
| **Single concentric lock** | • Tight spaces, low speeds, light duty | • Conveyors |
| **Double concentric lock** | • Low speeds, moderate duty | • Hammer mills |

## Total Cost of Ownership

When choosing a housed unit, consider not just the initial purchase price but also the cost of owning and maintaining the unit over its lifetime and how long that lifetime will be. It's the total cost of ownership that will matter in the long run.

The total cost of ownership not only includes the initial cost of the unit, but also the cost of installation, relubrication and replacement of failed components. It is important to consider all of these costs as you evaluate the most effective roller housed unit for your application.

Some important considerations for total cost of ownership are shown here:

| | Split block | Solid block |
|---|---|---|
| **Installation and mounting** | • 80-90 minute installation time due to multiple components, lubrication and clearance adjustments | • 15 minute installation time due to one-piece, pre-lubricated, pre-set and sealed design |
| **Interchangeable components** | • Ability to inspect or replace bearing without the need to remount and align the housing | • Variety of housing styles, seal options and locking mechanisms for a wide variety of application conditions<br>• Dimensionally interchangeable with split-block designs |
| **Weight/size** | • For greater than 125 mm (5 in.), allows for installation in sections, an advantage when housings are very large and heavy | • For less than 125 mm (5 in.), allows for easier installation |
| **Seal effectiveness** | • Variety of seal options<br>• Seals ride on a machined shaft | • Variety of seal options<br>• Seals ride on the ground, inner race of the bearing and are less prone to damage<br>• Secondary seals available for highly contaminated environments |
| **Locking mechanisms** | • Effective locking via popular and easy-to-install tapered adapter | • Variety of locking mechanisms offer flexibility |
| **Housing styles** | • Pillow block is the predominant style and is popular in most industrial applications | • Variety of housing styles available to meet application and mounting needs |

Both split block and solid block roller housed units offer a variety of options to provide protection from contamination and deliver long bearing life. In general, due to the design of the product, the standard components of a solid block unit tend to offer better protection from contamination compared to the standard components of a split block unit.

Roller housed units play an important role in maximizing uptime of critical equipment. Choosing the right solution can improve uptime and reliability. Consider specific priorities, such as ease of installation, operating environment and total cost of ownership, when choosing the most effective unit for the job.

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